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DYNAMITE EXPERIMENTS.

By B. Bunting.

So much attention has been drawn to the use of dynamite as a method of cultivation that experiments were instituted both at the Experimental Plantations, Kuala Lumpur, and at Castleton Estate, Telok Anson, to test the effect of explosives on the growth of rubber.

The blasting operations at Kuala Lumpur were carried out by Mr. Macqueen of Nobel's Explosives Company, Ltd., Glasgow, and those at Telok Anson under the supervision of Mr. T. C. Nock, Assistant Inspector of Coconuts, Selangor.

The results of the Kuala Lumpur experiments were published by Mr. F. G. Spring, Agriculturist, in the *Agricultural Bulletin, F. M. S.*, Vol. II, No. II.

Experiments at Castleton Estate, Telok Anson.

The experiments at Castleton Estate were conducted on approximately 2 acre plots, the soil of which was a fairly strong loam overlying a heavy clay subsoil. The trees on both plots were planted 20 ft. x 20 ft. and one charge of gelignite was used per tree, *i.e.* per 400 sq. ft. It is interesting to note that the average girth of the control at the commencement of the experiments was nearly one inch larger than the dynamite plot.

The blasting operations were carried out on the 12th March, 1914, and the trees on both the plots were measured on that date. It should be noted that all measurements given in the following tables represent the average girth measured at 3 ft. from the ground.

Results of Dynamite Experiments at Castleton Estate Telok Anson.

Period. I.—Six Months.

	Control.	Dynamite Plot.
Average girth on 12th March, 1914.	16.44 ins.	15.59 ins.
Average girth on 12th Sept., 1914.	18.03 ins.	18.51 ins.
Average increase after six months.	1.59 ins.	2.92 ins.
Percentage increase after six months.	9.67%	18.73%

Period. II.—Nine months.

	Control.	Dynamite Plot.
Average girth on 12th March, 1914.	16.44 ins.	15.59 ins.
Average girth on 12th Dec., 1914.	19.08 ins.	19.79 ins.
Average increase after nine months.	2.64 ins.	4.20 ins.
Percentage increase after nine months.	16.06%	26.94%

Period. III.—One Year.

	Control.	Dynamite Plot.
Average girth on 12th March, 1914.	16.44 ins.	15.59 ins.
Average girth on 12th March, 1915.	20.21 ins.	20.66 ins.
Average increase after one year.	3.77 ins.	5.01 ins.
Percentage increase after one year.	21.93%	32.14%

Taking the experiments over a period of one year it will be observed that whereas the control gave an increase of 21.93 inches, the dynamite plot gave an increase of 32.14 inches for every 100 inches of the original girth, or an increase over the control of 10.20 per cent.

The operation has been repeated and as the trees on these plots have come into bearing we shall now be able to record the effect of dynamite on the yield of latex.

As the operation of dynamiting is a comparatively simple one a list of the necessary appliances, together with a short description of the method of procedure, may be of interest.

Appliances Necessary for Blasting.

1. Nobel's Gelignite, 7/8 in. diam x 3½ ins. containing approximately 1¼ oz. of explosive, in packets of 5 lbs. containing 50 cartridges.
2. Nobel's No. 6 Detonators, in cases of 100.
3. Nobel's Common White Safety Fuse, in rolls of 24 feet.
4. Nobel's Detonator Nippers.
5. Crowbar, about 5 feet long and 1¼ ins. diam.
6. Hardwood tamping rod, 3 feet long.

Blasting Operations.

A bore-hole is made with the crowbar to a depth of 2½ to 3 feet, care being taken to see that it does not go below the water level of the soil. After the bore-hole has been carefully drilled to the required depth the gelignite is prepared for charging same. A detonator is gently but firmly crimped on to the end of the safety fuse and, after a hole is made in the gelignite by means of the handle of the detonator nippers, it is inserted into the explosive, leaving about one third of the detonator projecting. The cartridge is then placed in the bore-hole and pressed down by means of a wooden tamping rod and the hole filled with earth, which is firmly pressed by means of the tamping rod. The fuse should then be cut off near the surface, only sufficient being left for firing the charge. It should be pointed out that fuse burns at the rate of 2½ to 3 feet per minute.

If during tamping the detonator is withdrawn from the cartridge a small piece of gelignite should be attached to the detonator and let down into the hole until it is in direct contact with the main charge; this, when fired, will be sufficient to explode the unprimed cartridge.

Effects of Dynamite.

On examining the hole after the explosion very little effect is apparent on the surface of the ground, but if the loose soil is removed a cavity will be found where the explosion occurred, the sides of which show a number of cracks or fissures all over the wall.

As dynamite always tends to exert its force against the strongest resistance its action is mainly downwards, and consequently very little of the subsoil is brought to the surface—a condition of things not desired. It is through these fissures that a better aeration of the soil and an improvement in the drainage is likely to ensue.

In some soils the existence of hard pan, which is a hard layer of clay or impervious subsoil, often produces considerable infertility due to ineffective aeration and bad drainage. In the cultivation of any soil the surface soil should never be mixed with the subsoil and dynamiting is the only satisfactory method of breaking up this hard-pan, thus producing a more efficient drainage and a better aeration, resulting in an increased fertility of the soil.

Cost of Blasting.

As a general rule the ordinary agriculturist is apt to treat any new method of cultivation with suspicion and, no matter what results are claimed, he must be supplied with costs of the operation in order to judge whether it is practicable or otherwise.

In carrying out some experiments over a fairly large area the writer kept a careful record of costs, including labour, which work out as follows:—

	Full Charge.	Half Charge.
Gelignite	6.4 cts.	3.2 cts.
Fuse	4.0 „	4.0 „
Detonators	2.7 „	2.7 „
*Coolies	.5 „	.5 „
Total ..	13.6 cts.	10.4 cts.

At a cost of 13.6 and 10.4 cents per charge the cost per acre for charges at 20 feet x 20 feet would be $14.69 and $11.23 for full and half charges respectively; whilst half charges at 10 feet x 10 feet would require 435 explosions which at 10.4 cents each would cost $45.24 per acre.

It is very doubtful whether full benefit is obtained from the initial outlay on the explosive and, except under special conditions, its use could not be recommended over very large areas. It might be used with considerable advantage in cases where a small patch of rubber in the clearing is very backward when compared with the rest of the field, and as this may have cost quite a large capital expenditure any extra expense might be justified.

The value of dynamite as a method of cultivation is not disputed and the real question against its more extensive use is simply a monetary one.

Other Uses of Dynamite.

Dynamite has been tried for the removal of tree stumps in new clearings with unsatisfactory results, the number of cartridges required to shatter a good sized stump being no less than 12 to 15 full charges costing about $2 per stump. It has, however, proved very successful in breaking up logs infested with termites which were causing serious injury in rubber clearings.

Experiments are being carried out to see the effect of dynamite for holing previous to planting, when half charges are usually found sufficient for this purpose. With half cartridges at 20 feet x 20 feet the cost would be $11.23; whilst the cost of holing for coconuts at 30 feet x 30 feet would only amount to $5.10 per acre.

It should be noted that when dynamite is used for holing the small pot-hole formed at the bottom of the cavity should always be filled up with earth by means of a sharp pointed stick previous to planting, otherwise the soil would settle away from the roots with disastrous results to the newly planted trees.

*Six coolies prepared, tamped and fired 240 holes in 4 hours at a cost of $1.20.

GENERAL CONCLUSIONS.

Taking into consideration the various experiments with dynamite which have been conducted by this Department we may arrive at the following conclusions:—

1. That dynamite is unequalled for breaking up hard-pan or layers of imprevious subsoil, which not only prevent the roots from going down to the subsoil but interfere with the drainage.

2. It is most effective on heavy clay and hard laterite soils, and least effective on light or loose soils which offer no resistance to the explosion.

3. That it might be profitably employed in holing previous to planting, especially in heavy soils, half a charge of dynamite being sufficient for this purpose.

4. It may be successfully used in breaking up logs and tree stumps infected with termites in rubber clearings.

5. That the value of dynamite for cultivation is not doubted, but the high cost of the explosive prevents its more general use.

MINUTES OF MEETING OF PLANTERS' ASSOCIATION OF MALAYA.

Held at Seremban on June 30th, 1915, at 10.30 a.m.

PRESENT:

Mr. W. Duncan (in the Chair), Mr. H. C. E. Zacharias (Secretary) and the following *Delegates*:

From Batu Tiga Dist. P. Ass.:—Carlyle W. Bell, H. E. G. Solbe.
„ Central Perak P. Ass.:—A. H. Orr, A. B. Milne.
„ Johore Planters' Ass.:—E. D. Butler.
„ Kajang Dist. P. Ass.:—E. N. T. Cummins, H. C. Cummins, G. L. O'Hara Hickson, R. C. M. Kindersley.
„ Kapar District P. Ass.:—L. Mooijaart.
„ Klang District P. Ass.:—H. R. Quartley.
„ Kuala Langat D. P. A.:—R. W. Munro.
„ Kuala Lumpur D. P. A.:—R. C. Kinder, H. Armstrong, W. Leggatt, F. G. Harvey.
„ Kuala Selangor D. P. A.:—J. Hunter, J. M. Booth.
„ Lower Perak P. Ass.:—Robt. H. Phillips, Maurice Maude.
„ Malacca Planters' Ass.:—E. E. Smith.
„ Negri Sembilan P. Ass.:—J. D. McCulloch, V. A. Tayler, C. Ritchie, A. Dupuis-Brown, P. W. N. Farquharson, G. B. W. Gray, A. Burgess.

From Taiping Planters' Ass.:—E. L. Huson.
„ Ulu Selangor D. P. A.:—W. de L. Brooke, F. W. Davies.

Honorary Member: Mr. J. R. O. Aldworth.

Visitors:—F. R. Holland, James Rea, A. G. Simmons, P. S. Stewart, D. B. S. Teale, W. J. Doughty, A. G. Overend, H. T. Piper, E. G. Wilde, J. S. Haycroft, J. Burgess, W. K. Foster, R. C. Weston, R. A. B. Adams G. D. van Someron, A. J. W. Lane, F. J. Lloyd, E. G. Mills, J. Norman Sturroch, A. W. Robertson, Geo. M. Nee, N. L. Leonard, H. Morris, L. Dowdall, F. T. Wynyard Wright, H. R. Thompson, G. W. Hingston, W. Buyers, Horace Pratt and T. Slade-Adames.

RESUMPTION OF CHINESE IMMIGRATION.

The *Secretary* reports having addressed the following letter to the Federal Government:—

Kuala Lumpur, 3rd May, 1915.

Under Secretary, F. M. S.,

Sir,

I have been instructed to call the attention of your Government to the serious shortage of labour due to the restriction of the immigration of Chinese, which kind of labour is largely and in increasing numbers employed on the estates of the Peninsula and to submit that Chinese immigration be again resumed in full.

I have, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

The *Secretary* also reports that subsequently a deputation had waited on the Chief Secretary and submits the following Memorandum on the interview:

MEMORANDUM.

A deputation consisting of the Chairman and Messrs. A. B. Milne and J. Davidson McCulloch interviewed the Chief Secretary on June 9th.

The Chairman introduced the deputation and explained that its object was to request Government to remove all restrictions on Chinese Immigration. The Chairman added that it was not a matter that affected Perak to any extent, as the number of Chinese employed in that State for agricultural purposes was small.

Mr. McCulloch speaking for Negri Sembilan, stated that the

shortage of labour there affected the planters to an extent that was very serious and meant heavy loss to the estates. Many properties had 30 to 35 tasks per day untapped in spite of the fact that higher wages than formerly were being paid. The deplorable effect that the knowledge of the shortage of labour had upon the work and general attitude of the Chinese coolie was emphasised. Mr. McCulloch further pointed out that present rates of passage from China were so high as to render prohibitive any such inrush of coolies as might prove embarrassing to Government.

Mr. Milne stated that Chinese wages in Perak had risen 5 to 10 cent during the past few months.

The Chief Secretary gave a very sympathetic hearing to the deputation, and mentioned that he did not think there could now be any serious objection to the removal of all restrictions. The matter, however, did not lie in his hands but in those of the High Commissioner to whom he would write strongly supporting the views expressed by the deputation.

The Chairman thanked the Chief Secretary and the deputation then withdrew.

The *Secretary* reads the following further letters received by him on the subject:—

Kuala Lumpur, 22nd June, 1915.

Sir,

With reference to your interview with the Chief Secretary on the 10th June, 1915, on the subject of the restriction of immigration from China, I am directed to inform you that the restriction in the Straits Settlements, which prevented ships from bringing in more than one third of the number of Chinese that they are permitted in ordinary times to carry, has now been relaxed to the extent of permitting the importation of one half of the usual number. Should the number now permitted to enter fall short of 10,000 a month, it is understood that the Government of the Colony will always be ready to consider any application for special facilities on account of any shipment of immigrants for one estate.

2. The Chief Secretary would be glad to learn whether your Association considers these arrangements satisfactory.

I have, etc.,

(Sgd.) S. W. McArthur,

Ag: Under Secretary, F. M. S.

W. Duncan Esq.,

Chairman, Planters' Association of Malaya.

"The Malacca Planters' Association."

Malacca 19th June, 1915.

The Secretary,

Planters' Association of Malaya,

Dear Sir,

Chinese Immigration.

For the information of your Association we beg to advise you that as the result of representations made to Government by this Association, the space for deck passengers from China has been increased to one half of a ships complement, as notified in the Straits Settlements' Government Gazette of the 11th instant.

This Association considered that unlimited Immigration should be permitted for a time, but this the Government showed would be, for certain reasons, inadvisable.

The writer interviewed the Colonial Secretary on behalf of this Association, and was informed that, during the month of May the number of immigrant arrivals from China was 6,200. The increased space would provide accommodation for 10,000 coolies per month, and this number the Government considered was sufficient. The Association was then given an assurance that, in the event of the increased space to half a ship's complement for deck passengers now allotted for Chinese Coolies arriving from China, not proving sufficient to bring in 10,000 coolies monthly into Singapore within two months, the Government is prepared to increase the space to two thirds, or if necessary to three fourths. Further that if the Malacca Planters' Association wish to recruit Chinese labour direct from China and, if they can arrange for any shipping Company to carry the coolies, Government will be prepared to allow that Company's steamers to carry up to 100 coolies per steamer over and above the deck accommodation authorised for the transport of deck passengers for the time being, but that all arrangements for the shipping of these Coolies from China and the receiving of them in Singapore are to be carried out by the Malacca Planters' Association.

We trust that this information will be of use to your Association.

We further beg to advise you that this Association is quite satisfied with the above concessions made by Government, and that we do not wish to press the matter further.

Yours faithfully,

Sime Darby & Coy., Ltd.,

(Sgd.) Herbert M. Darby,

Secretaries.

Klang, F. M. S., 27th June, 1915.

The Secretary,

Planters' Association of Malaya,

Dear Sir,

I am instructed to inform you that the Klang District Planters' Association is of opinion that pressure should be brought to bear on the Government to remove all restrictions on the immigration of Chinese Agricultural Labour.

Yours faithfully,

(Sgd.) C. A. Buxton.

Hon. Sec: Klang D. P. A.

Mr. *McCulloch* considers that no case had been made out, why *all* restrictions should not be removed. People seemed to forget that Chinese would not immigrate, unless they knew definitely of prospects of work on their arrival in this country. The present shortage continued and he knew of estates where as many as 50 tasks per diem remained untapped for lack of labour. The present rates were absurdly high. He knew that it cost a man from his village to Negri Sembilan as much as $60 as against $18 before, so that, even if all Government restrictions were removed, there could still be no inrush of Chinese. Another point to remember was, that all deck passengers were not agricultural labourers. He felt very strongly that normal conditions should be reverted to at once, if the industry was not to suffer serious damage.

Mr. *Cummins* observes that it was insufficient to consider the number of immigrants. As a matter of fact he understood that there were twice as many emigrants as immigrants, so the Government's concessions were really very deceptive. There were about 100,000 acres of young rubber coming into bearing—who was going to tap these areas, and if there was no labour for doing so, how were these estates to be financed? Unless sufficient labour was forthcoming, there was a very real danger of many and many a property going to wreck and ruin.

Mr. *J. R. O. Aldworth,* Controller of Labour, says that he had no figures as regards Chinese labour, but in May the immigration from India exceeded the emigration for the first time since last August. (Applause.) The excess was about four thousand. He thought that the June excess would be between three and five thousand.

Mr. *R. C. M. Kindersley* remarks that the Government was reasonable. If the coolies they got were not numerous enough

Government was prepared to meet them. The question as to the higher rates charged by the shipping companies was important. He would suggest that Government be asked to take the matter up and bring pressure to bear on the steamship companies.

Mr. *Butler* believes that the actual increase in the passage money did not exceed $3 and that the rest was due to the excessive increase in brokers' &c. charges.

Mr. *Smith* informs the meeting that H. M.'s Consuls in Southern China were advising the public in the agricultural districts concerned, that restrictions on emigration to Malaya had been removed, and also of actual steamer fares now charged.

Mr. *McCulloch* formally moves, Mr. *Quartley* seconds, and it is carried unanimously that "While acknowledging the way Government have met the representations made by this Association, this meeting is of opinion that in view of the normal conditions now prevailing in this country, all restrictions on immigration from China should be removed."

Mr. *Munro* suggests that in the covering letter official figures of Chinese Immigration be quoted and that it also be pointed out that all deck passengers are not agricultural labourers.

Agreed.

Mr. *Farquharson* wishes the Secretary to be instructed to write to the Shipping Companies concerned re passage rates charged at present and to enquire whether they are prepared to revert to their pre-war rates, provided all restrictions on immigration are removed. He also would like the Secretary to find out what brokerage was charged at present.

Agreed.

Advisory Labour Committee.

The *Secretary* submits the following correspondence:—

Kuala Lumpur, 3rd May, 1915.

Secretary to His Excellency

The High Commissioner, F. M. S.,

Sir,

I have the honour to inform that at a General Meeting of this Association held on the 25th of April, I was instructed to submit a suggestion, that the Governments of the F. M. S., Straits Settlements and of Johore be approached with a view of establishing a permanent Advisory Labour Committee, consisting partly of Officials and and partly of Planters.

I have, etc.,

(Sgd.) H. C. E. Zacharias,

Secretary.

High Commissioner's Office,
Singapore, 19th May, 1915.

Sir,

I am directed to acknowledge the receipt of your letter dated the 3rd instant, submitting a suggestion on the subject of the establishment of a permanent Advisory Labour Committee, consisting partly of Officials, partly of Planters.

2. In reply I am to state that as at present advised the Government sees no reason for adopting the suggestion put forward.

I have, etc.,
(Sgd.) W. H. Lee Warner,
P. S. H. C.

The Secretary,
Planters' Association of Malaya,

MAGISTRATE AT PORT SWETTENHAM.

The *Secretary* reports that this question had been considered by the Standing Committee and that as a result he had addressed the following letter to the Controller of Labour:—

Kuala Lumpur, 10th June, 1915.

Controller of Labour, F. M. S.

Sir,

I have the honour to draw your attention to a difficulty existing at Port Swettenham as to the issue of warrants for the arrest of absconders.

This difficulty often arises on days when steamers are about to sail for India, when the presence of these men on board steamer is frequently only so late discovered, as to give no time to the employer to go to Klang to obtain a warrant.

The Harbour Master is of course a Magistrate, but his duties usually take him away from his office, so that for practical purposes, there is no person stationed at Port Swettenham, authorised to issue these warrants, when required.

In the circumstances, I am instructed to enquire what assistance in the direction named could be obtained from your department and more particularly from the Assistant Controller of Labour, ordinarily stationed at Klang.

I have, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

Mr. *Aldworth* called upon by the Chairman, hardly thinks that the need had as yet been proved. If there really was a demand for a Magistrate, he would see to it that it was met. He was still enquiring into the matter, but so far had only discovered one case this year, when application for a warrant at Port Swettenham had been made. He considers it important that he should be furnished with specific cases, proving the hardship complained of.

Mr. *Bennett* replies that he alone had this year applied three times for a warrant. The urgent need was for the Assistant Controller of Labour at Klang to be made a Magistrate and given the authority of issuing warrants at Port Swettenham.

Mr. *Mooijaart* points out that most planters knew it was useless to apply for a warrant. It therefore did not follow that the want of applications proved the want of the need.

Mr. *Duncan* suggests that the matter stand over, until an official reply is received from the Controller of Labour to the Secretary's letter. Mr. Aldworth had to-day had an opportunity of hearing their point of view and no doubt would carefully consider it.

Agreed.

APPLICATION OF LABOUR CODE TO SMALL HOLDERS.

The *Secretary* gives an outline of the action taken in the matter by the Standing Committee and submits the following correspondence, which had since ensued:

Kuala Lumpur, June 10th, 1915.

Controller of Labour, F. M. S.

Sir,

I have the honour to submit to you the advisability of amending the Labour Code by

(1) omitting in § 66, i. the words "on a place of employment"

(2) adding to the definition of "Indian Labourer" in § 150, i. "but excepting the growing of wet padi."

The effect of these amendments would be to bring under the provisions of the Labour Code employers of less than ten Indian labourers—a point which has for a long time constituted a very legitimate grievance—without at the same time interfering with the special conditions prevailing in the Krian District.

I have, etc.,

(Sgd.) H. C. E. Zacharias,

Secretary.

Office of the Controller of Labour,
S. S. and F. M. S.
24th June, 1915.

Sir,

In reply to your letter dated 10th June current, submitting the advisability of amending sections 66 (i) and 150 (i) of the Labour Code, I have the honour to invite your attention to this office letter No: 616/1913 to which, so far as I can ascertain no reply has been received. The position appears to me to be the same as when Mr. Hose addressed that letter to you, except that the amendment to section 66 in the Bill amending the Labour Code, which was introduced at the meeting of the Federal Council held in November, 1913, was not adopted when Enactment 27 of 1913 was considered and passed.

I have, etc.,
(Sgd.) J. R. O. Aldworth,
Controller of Labour, F. M. S. & S. S.

Secretary,
Planters' Association of Malaya,

Kuala Lumpur, June 26th, 1915.

Controller of Labour, F. M. S.

Sir,

I have the honour to acknowledge receipt of your letter 3/259 of June 24th 1915.

Your letter 616/1913 was considered at the meeting of this Association held on Jan. 11th, 1914, when Mr. Hose was present and took part in the discussion.

The reason why the proposed amendment of the Labour Code, viz: to omit in § 66, i. the words "on a place of employment," was not adopted when En: 27 of 1913 was passed, appears to be that such adoption would have borne hardly on planters in the Krian District, where special conditions would seem to exist.

The matter has since been under the consideration of the Standing Committee, in whose opinion the addition of the words "but excepting the growing of wet padi" in § 150, i. removes any legitimate grievance on the part of Krian planters and thereby all objection to the adoption of the amendment in question.

I have, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

Mr. *Duncan* would like to add to this, that the only persons affected and to be considered were, not the Krian Planters, but the Krian Padi planters, of whom a number were Tamil smallholders. He presumed nothing further was to be done, pending the Controller's reply.

6. Coolies on B. I. Boats.

The *Secretary* reports that this matter had been discussed at the last meeting of the Standing Committee and that the following correspondence had since passed:—

Kuala Lumpur, 10th June, 1915.

J. R. O. Aldworth Esq.,
Chairman, Indian Immigration Committee,

Sir,

The attention of my Committee has been drawn to the very unsatisfactory treatment received by Indian Immigrants on board the B. I. steamers, and to submit that it is highly desirable that European Inspectors be appointed.

I have, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

Office of the Controller of Labour,
S. S. and F. M. S.
Kuala Lumpur, 18th June, 1915.

Sir,

I have the honour to acknowledge receipt of your letter dated the 10th June, 1915, regarding Travelling Inspectors on the British India Steam Navigation Company's contract steamers, which will be considered at the next meeting of the Indian Immigration Committee.

I have, etc.,
(Sgd.) J. R. O. Aldworth,
Controller of Labour, F. M. S.

The Secretary,
Planters' Association of Malaya,

Mr. *Milne* observes that the matter had originated in a case of bad overcrowding and general unsatisfactory treatment of coolies on board the "Golconda," the first boat leaving India on the resumption of immigration to this country. Possibly, in fact most probably, this case was an exceptional one. Yet he could not help

feeling, that all was not well and he would refer to a significant passage in Mr. Rai's book prepared in reply to certain statements made in India regarding the treatment of coolies in Malaya, in which the coolies were described as having to go through a great deal of roughing it when abroad. He could not think why this should be so, as the B. I. Co. were paid high rates.

This sort of thing undoubtedly militated against their getting the best class of coolie to come over here and he would be glad, if the Madura Co's good offices in this matter were sought.

Mr. *Munro* had only just returned from a trip to the Tamil districts and he quite agreed with Mr. Milne that this was a matter which concerned them closely. If anything of that sort was going on it must be put a stop to. This might, however, be an exceptional case, as when he visited India everything appeared to be satisfactory. The 'tween decks were very clean and the comfort of the coolies seemed to him to have been studied. He had made a point of asking the coolies, but could hear of no complaints.

Mr. *Duncan* considers that in the circumstances the matter had perhaps better be allowed to stand over for the time being.

Advertising in India.

The *Secretary* submits the following correspondence:—

Kuala Lumpur, 3rd May, 1915.

J. R. O. Aldworth Esq.,

Chairman, Indian Immigration Committee,

Sir,

I have the honour to inform you that at the last Annual General Meeting of this Association I was instructed to put forward a suggestion with a view of it being made known in the recruiting districts of Southern India that the state of this country is no longer in any way unsettled as had been the case in the early part of the War and that recruits be reassured of a safe passage from India.

I have, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

Office of the Controller of Labour,
S. S. and F. M. S.,
Kuala Lumpur, 20th May, 1915.

Sir,

In reply to your letter of the 3rd May current putting forward a suggestion by your Association to the effect that it should be

made known in the recruiting districts of Southern India that this country is in a settled condition and that a safe passage from India can be assured to recruits, I have the honour to inform you that your letter was considered on the 12th May by the Immigration Committee, who resolved that in their opinion there is, in view of the improved state of immigration, no necessity for the proposed action.

I have, etc.,
(Sgd.) J. R. O. Aldworth,
Controller of Labour, F. M. S.

The Secretary,
Planters' Association of Malaya,

OUTSIDE EMPLOYMENT ON SUNDAYS.

The *Secretary* reads the following correspondence:—

Kuala Lumpur, 14th June, 1915.

Sir,

As you are aware a bill was introduced by the Hon. Mr. Macfadyen at the last meeting of the Federal Council for the purpose of effecting certain amendments in the Labour Code and the further stages of the bill were adjourned in order that full consideration might be given to the proposed amendments of the law which the bill was intended to effect.

2. Clause 3 of the bill aims at "making it an offence for others than the regular employer to work Indian coolies on a legal holiday." There would appear to be no legal obligation on the part of an employer to provide regular work for his labourers and it has therefore been suggested that if a labourer is to be deprived by law of the right to employ his time as he thinks fit when he is not working for his regular employer it would be only reasonable that the employer should be required by law to pay full wages for six days in each week to all labourers who are willing and fit to work on those six days.

3. Without expressing any opinion as to the attitude of the Government on the point in question I would ask you to bring this suggestion to the notice of the Planters' Association of Malaya with a view to obtaining an expression of their opinion on the subject.

I have, etc.,
(Sgd.) E. L. Brockman,
Chief Secretary, F. M. S.

Chairman,
The Planters' Association of Malaya,

Caledonia Estate,
Prov. Wellesley,
19th June, 1915.

Sir,

I have the honour to acknowledge receipt of your letter (No: 1851/1915) of 14th instant, on the subject of the Hon. Mr. Macfadyen's private Bill which was introduced at the last meeting of the Federal Council.

2. In reply, I would state that the suggestions made in your letter to the effect that employers should be required by law to pay full wages for six days in each week to all labourers who are willing and fit to work on those six days, will be brought before the Planters' Association of Malaya, at the next meeting of the Association to be held at Seremban on 30th June.

I have, etc.,
(Sgd.) Wm. Duncan,
Chairman, Planters' Association of Malaya.

Sir E. L. Brockman, K. C. M. G.,
Chief Secretary, F. M. S.,

Mr. *Tayler* considers it a scandalous anomaly that once a week it should be lawful for the whole labour force of an estate to be crimped away by a neighbour, be that neighbour a big estate or a small holding. He for one could not see that the Chief Secretary's new suggestion had any connection with this principle, against which they were contending and he hopes the Association will not allow itself to be drawn from the point at issue.

Mr. *Ritchie* thinks it not quite fair that the coolie should be penalized. He would prefer to see the penalty fall on the employer alone.

Mr. *McCulloch* refers to the new amendment to the Labour Code, proposed by the Association as Section 99, *a,* and moves that their Legal Adviser be asked to draft an addition, embodying a provision, that it be an offence to employ coolies without consent of the regular employer and that such consent may not be withheld if the regular employer is unable to provide 6 days work to the coolie in any one week.

Mr. *Kindersley* seconds the proposal, which is carried.

Mr. *Duncan* remarks that this motion had not yet disposed of the Chief Secretary's letter. He personally would suggest that their reply should be in the negative, as there were cases, in which it suited both the coolies and their employers, to work on four or five days a week only. If that was so, there seemed to be no reason whatsoever, why an employer should pay the cooly for the days that he did no work.

Agreed to.

CURRENCY.

Mr. *Leggatt* reports that Mr. McCulloch and he interviewed the Colonial Treasurer and the local Bank Managers, and that their proposals had received the unqualified support of all whom they had approached. Nothing now remained, but for them to state how much extra ½ cent and ¼ cent coinage they wished to put into circulation.

Mr. *McCulloch* relates that, whatever the practice in the F. M. S. was, he had been very pleased to find in Singapore both these coins freely circulating.

Mr. *Duncan* remarks that in the circumstances the actual formulation of their requirements had best be left to the Standing Committee.

Agreed.

AGRICULTURAL DEPARTMENT.

The *Secretary* explains that this matter had been brought up by the C. P. P. A., whose intentions had apparently been misunderstood at their last meeting and who had since intimated that they desired the subject to be proceeded with. Under instructions of the Standing Committee he had consequently addressed the Director of Agriculture and now submitted correspondence.

The Director of Agriculture wrote explaining the attitude of the Department towards pink disease, and also inviting the Association to attend officially at a demonstration at the Vulcanising and Testing Factory.

Mr. *Duncan* thinks these letters were extremely satisfactory. The point was that a good deal more work had been done than they were aware of.

Mr. *Milne* says that this had been an unpleasant matter. They had felt that the Agricultural Department was not giving them proper attention and it seemed to him that the reply just read was typical of the stand taken by the Department. It was an essay on Pink Disease, when the general efficiency of the Department was questioned.

There were £28,000,000 invested in the rubber industry in the F. M. S. and he thinks it was just about time that the Agr. Dept., which was in every way well equipped, should make an effort of making itself useful to the industry. Theirs had been a very repugnant task and he would say that Mr. Lewton-Brain had taken their criticism in very good part and had apparently now taken the matter up resolutely and had promised to give them lectures. He would propose a vote of thanks to Mr. Lewton-Brain for making his Department useful yet. (Laughter).

Mr. *Harman-Orr* remarks that there had been no question of Pink Disease and that his Association had not moved in the matter for that reason. The Director's of Agriculture reply seemed to him quite unsatisfactory.

Mr. *Duncan* supposes that he expresses the feeling of the meeting in regard to the invitation to the Rubber Testing Station, by saying that they would gladly avail themselves of it and he would suggest doing so on the morning of the next P. A. M. meeting.

Agreed.

GOVERNMENT SERVANTS AS PATENTEES.

The *Secretary* submits the following correspondence:—

Kuala Lumpur, 3rd May, 1915.

Under Secretary, F. M. S.,

Sir,

I have the honour to inform you that the attention of this Association has been drawn to an application for a patent in the name inter alia of two members of the Department of Agriculture of the F. M. S.

The principle involved came up for discussion at the Annual General Meeting of this Association held on the 25th of April, when the following Resolution was passed unanimously:

"That this Association protests against members of "technical branches of the Government Service being allowed "to apply for Patents or to hold an interest in patents for "processes connected with their own professional work."

I have, etc.,

(Sgd.) H. C. E. Zacharias,

Secretary.

Kuala Lumpur, 17th May, 1915.

Sir,

Referring to your letter of the 3rd instant, I am directed to inform you that the question of members of technical branches of the Government Service being allowed to apply for patents or

to hold an interest in patents for processes connected with their own professional work is already engaging the attention of the Government.

I have, etc.,
(Sgd.) A. Caldecott,
for Ag: Under Secretary, F. M. S.

The Secretary,
Planters' Association of Malaya.

War Relief.

The *Secretary* submits the following correspondence:—

"Kapar District Planters' Association."

May 19th, 1915.

The Secretary,
P. A. M.

Dear Sir,

At a meeting held yesterday at Kapar Rest House I was instructed by my Committee to write and ask you the feasibility of a standing Committee meeting of the P. A. M. being called to discuss the advisability of a fund being formed for the benefit of Planters who have served in and who have been placed in need of pecuniary assistance by the War. It was thought that the majority of Planters would more willingly subscribe to a fund of this kind than to any other.

Yours faithfully,
(Sgd.) Noel Fisher,
Hon. Secretary.

Kuala Lumpur, May 20th, 1915.

Noel Fisher Esq.,
Hon. Secretary, Kapar D. P. A.,

Dear Sir,

I thank you for your favour of the 19th inst. and in reply beg to say that I have in accordance therewith called a Meeting of the Standing Committee for June 9th and have placed on the Agenda your proposal of forming a War Relief Fund for the benefit of Planters, adversely affected by the War.

Believe me, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

Kuala Lumpur, 10th June, 1915.

Noel Fisher Esq.,

Hon. Secretary, Kapar D. P. A.,

Dear Sir,

Further to my letter of the 20th ulto., the question of forming a War Relief Fund for the benefit of Planters, adversely affected by the War, was duly considered by the Standing Committee at their meeting held yesterday.

In the meantime, as you are no doubt aware, the scope of the F. M. S. War Relief Fund has been altered to include

"(2) Assistance to those who have gone from the F. M. S. to "take part in the War, or to their dependents."

The subject has been placed on the Agenda of our next General Meeting, to be held at Seremban on the 30th inst., so that a general discussion of the whole question may take place.

Believe me, etc.,

(Sgd.) H. C. E. Zacharias,

Secretary.

Mr. *Duncan* says that under what was now termed the F. M. S. War Relief Fund it was possible to earmark funds. It was possible to give subscriptions to be devoted to the aid of local planters. All agreed that those planters who had gone from here sacrificing everything should have aid from those who could afford it. (Applause.) He thought that boards of Directors should be approached.

Mr. *L. Mooijaart* pointed out that allocation No: 2 of the F. M. S. Fund was for those men who were serving from the F. M. S., and not planters exclusively. He thought that the planting community had nothing to be grateful for to the other communities. He would suggest the opening of a fund for planters under the auspices of the P. A. M. Many who were not subscribing at present would be only too glad to subscribe under such conditions. The administrative work, such as investigating cases, should be left in the hands of the Benevolent Fund Committee. He was sure there would be a ready response.

Mr. *Kindersley* hopes that this will not be meant to imply that planters should cease supporting the general fund which was being raised now.

Mr. *Milne* proposes that the collection of money for their new P. A. M. War Relief Fund be left to the constituent associations.

He deprecated all advertisement, which seemed to him quite unnecessary.

Mr. *Duncan* concurs and suggests that the Secretary circularise all constituent associations accordingly and also invite the co-operation of the R. G. A.

RUBBER GROWERS' ASSOCIATION.

The *Secretary* submits the following correspondence:—

London, E. C.
15th April, 1915.

Dear Sir,

With reference to my letter dated the 11th December, 1914, and to your acknowledgment of the 12th January last, I have to advise you that at a meeting of my Council held this week a letter from your Chairman, the Hon'ble Mr. E. Macfadyen, addressed to my Chairman, Mr. E. L. Hamilton, under date of the 25th January (? February), on the subject of representation of this Association in the Federated Malay States was considered.

My Council was gratified to learn that the suggestion put forward met with cordial support on your side and that a general feeling exists in the F. M. S. that closer relations between this Association and the Planters' Association of Malaya will prove of benefit to the Industry.

The proposals submitted by the Hon. Mr. E. Macfadyen regarding the constitution of the Committee were unanimously accepted by my Council, who also voted the sum of $50 a month to yourself as Secretary, to cover office expenses, stationery etc., connected with the new Committee.

I shall be much obliged if you will due course let me have the names of the gentlemen who are appointed to serve on the new Committee.

I will arrange to supply you with circulars which we issue to our members from time to time so that you may be posted in this direction, and I hope you will not hesitate to favour me with any suggestions which occur to you for the carrying out of the objects in view.

Yours faithfully,
(Sgd.) Frank G. Smith,
Secretary.

Secretary,
Planters' Association of Malaya,

Kuala Lumpur, 17th June, 1915.

Secretary, Rubber Growers' Association,
London, E. C.

Dear Sir,

I beg to acknowledge receipt of your favour of the 15th April, contents of which I have placed before our Standing Committee. I have also been in communication with the Selangor Chamber of Commerce, and now have pleasure to advise you that the following gentlemen have been appointed and are constituting the local R. G. A. Committee:—

	P. A. M.	S. C. C.
Chairman:	Mr. W. Duncan	Mr. H. P. Clodd.
Committee Members:	The Hon'ble Mr. E. Macfadyen	The Hon'ble Mr. W. Nutt
	Mr. R. C. M. Kindersley	Mr. A. K. E. Hampshire
	„ A. B. Milne	
Secretary:	„ H. C. E. Zacharias.	

Believe me, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

Correspondence was also read with the Secretary, Rubber Growers' Association, on the subject of the Country Lands (Cultivation) Enactment, 1914.

SUNDAY LABOUR.

The *Secretary* reports having addressed the following letter to the Bishop of Singapore:

Kuala Lumpur, 3rd May, 1915.

The Right Reverend,
The Lord Bishop of Singapore,
London, W.

My Lord,

I have the honour to inform you that your letter of the 10th of February on the subject of Sunday Labour was duly submitted to the Annual General Meeting of this Association hold on the 25th ulto.

As the time was already advanced when this subject came up for discussion, it was agreed to bring up again so far-reaching a question at the next meeting of this Association, which will be held on June 30th, but in the meantime I have been instructed to inform you that this Association sees no objection to your Lordship approaching the Rubber Growers' Association in the sense indicated.

I may add that most speakers seemed in sympathy with the idea of having one clear day's rest, but as already remarked, the matter has not yet been tested by an actual vote.

I have, etc.,

(Sgd.) H. C. E. Zacharias,

Secretary.

The *Secretary* reports also the receipt of a telegram from the Batang Padang P. A., regretting that none of their delegates could attend and requesting him to record their deprecation of the stoppage of Sunday Labour.

Mr. *Maude* considers that the matter had been sufficiently threshed out in the correspondence columns of the local press and all that he could add was to emphasize once more the absolute necessity of a conscientious worker getting a complete rest once a week.

Mr. *Milne* says that should Sunday work be stopped three things would take place. There would be a 20% drop in production, a 20% increase in wages and a huge boom in the gin sling traffic. (Laughter.) He considers the present time quite unusual for the introduction of any such legislation and would move that the question be left in abeyance.

Mr. *Cummins* adds that people seemed to forget that where Chinese were employed on contract, these Sunday Rest proposals simply could not be enforced, as the Chinese would simply insist on going on working. Mr. Maude with an old estate paying 200% dividends could easily talk of reducing production, but the case of young estates was a very different matter.

Mr. *McCulloch* seconds Mr. Milne's proposal, to drop the matter for the time being, as he was similarly convinced that the time was not ripe for the Association taking any steps in the matter.

Mr. *Ritchie* would like to see a rider added to the motion, that as soon as found practicable, the introduction of the principle of stopping all Sunday Labour would be proceeded with.

The motion is then carried.

The time being advanced, Mr. *Duncan* suggests that the other items still on the agenda be deferred until their next meeting.

Agreed to.

Mr. *Duncan* proposes that their next meeting be held at Kuala Lumpur on the afternoon of Sept. 8th, the morning to be devoted to the visit of the Agricultural Department.

Agreed to.

The Meeting terminates at 1.15 p.m.

H. C. E. Zacharias,

Secretary.

THE EMPIRE'S RESOURCES IN PAPER MAKING MATERIALS.

The following abstract is compiled from a most interesting lecture on the Empire's resources in paper making material delivered recently by Mr. S. C. Phillip before the Royal Society of Arts.

The lecturer is a paper maker of considerable reputation and therefore entitled to speak with authority on a subject, to which he has devoted considerable attention.

As is probably well known, our cheap papers (particularly newspapers) are now made mainly from wood pulp derived chiefly hitherto from Scandinavia, but during recent years to a larger and increasing extent from the huge forests in Canada. At the present time Canada is stated to provide 320,000 tons of paper making material in the form of wood or wood pulp, produced by chemical or mechanical means. One large undertaking in the province of Quebec is said to produce 100,000 tons per annum, a very large proportion of which is consumed in England.

The chief materials utilised for paper making at the present time are rags, wood and esparto grass, but recently many fibres have been experimented with for the purpose in view, chief among which is bamboo. A number of these have been boomed at different times, but most have died a natural death, on account of either insufficiency of supply or unsuitability on a practical scale.

Reference is made to a large number of plants which have been experimented with, but have hitherto not been utilised on a commercial scale. Among these are some which are of interest in this country, for example some of the Agaves, Bamboo, Nipa Palm, Imperata arundinacea, commonly known as lalang, and waste pine-apple fibre.

The lecturer's method of treating his subject under the various countries concerned may be adopted.

Great Britain.

Great Britain is not rich in paper making materials. A few years ago attention was drawn to the possiblilities of Marram (beach) grass (Ammophila arenaria) which is abundant on the sand hills round the coast and in other parts of the Empire; this plant however has probably not been used on a commercial scale, although investigated and stated to yield a paper of good quality.

Suggestions have been made more recently with regard to the utilisation of wood in connection with the recent proposals for reafforestation, but it is extremely unlikely that timber can be grown profitably in Great Britain for paper making purposes. Numerous experiments have been made with peat and it is said to be used successfully in America for "wrapping papers."

Several ventures in Great Britain however have been unsuccessful, and at the present time the possibilities of peat are not likely to be realised. One great drawback to the utilisation of peat is the small yield of actual valuable material.

Canada.

The resources of Canada in paper making materials are enormous and probably not yet realised. The forest area is probably 500 to 600 million acres of which about half contains timber of value for this purpose.

During recent years the forest reserves in Canada have been increased enormously, and the timber resources husbanded, and the industry placed on a more scientific basis. The principal wood used for paper making purposes is Spruce both in Canada and elsewhere, while balsam fir is coming into use and hemlock and jack-pine to a smaller extent. The wood pulp from these sources has been obtained by 4 different methods, the greatest amount (52·6 per cent) being made into mechanical pulp, with only a comparatively small proportion (0·3 per cent) of soda pulp, 33·1 per cent sulphite pulp and 14 per cent sulphate pulp.

Opinion apears to be varied as to the exhaustion or otherwise of Canada's timber resources.

Of the various provinces, probably British Columbia is unrivalled in respect to natural resources of wood pulp and water power which renders the manufacture cheap. Quebec take first place both in regard to production of wood pulp and unutilised timber.

Balsam fir is increasing in favour in spite of certain disadvantages which have been overcome, as it is less valuable than spruce for other purposes and readily reafforests itself, and becomes suitable for wood pulp in a short time. Poplar is becoming of some importance and is said to be the only wood treated by the soda process.

Small quantities of bass wood and elm are also used.

Newfoundland.

The island of Newfoundland has come much to the fore in connection with the paper making industry on account of the fact that two important British companies have recently developed its

enormous pulp wood areas, bringing much additional wealth to the Colony. The forests have their principal value in timber suitable for pulp and the output of wood pulp is increasing rapidly, spruce and fir predominating, while balsam fir is now being used more extensively.

Newfoundland and Canada are the only wood pulp producing countries in the Empire.

Those, who imagine that our extensive forests in Malaya might be of considerable value for the production of wood pulp, do not realise the necessity of large areas of forest of one or two species only. The importance of this lies in the process of manufacture. Each wood often requires distinct treatment and the treatment required for one species might be insufficient for the other or the more drastic treatment required for one might destroy the cellulose fibre material in the other.

India.

The greatest attention in India has been directed to bamboo as a paper making material, which has been found to be a very satisfactory material and to be distributed over enormous areas in India and Burmah.

The cellulose experts of the Forest Institute and College at Dehra Dun—Messrs. Raitt and Pearson—have carried out many important investigations in connection with the problem of finding new sources of material. Bamboo according to Mr. Phillip will probably prove an important raw material for paper making, especially in the Far East. At present only two mills for treating bamboo are in existence, one in Formosa and the other in Indo-China.

In the case of bamboo, soda reduction is the preferable method of treatment and the material is very suitable for printing and litho grade papers. The commercial exploitation of bamboo is not easy owing to the number of species growing under very varying condition of soil, climate and altitude. Mr. Raitt has found that only five species are commonly exploitable, but these species fortunately represent 80 per cent of the whole in India. One expert states that bamboo can be converted into suitable pulp as cheaply as esparto. It may not be generally known that several paper mills exist in India and the principal raw material used has been baib or sabai grass (Ischœmum angustifolium), which is very similar to esparto, as is the paper made from it. It is easily reduced to a clean pulp and even the nodes are easily reducible. Baib however appears to be suffering from over-cropping and there has been a serious deterioration in quality and decrease in quantity. In con-

nection with grasses especially, large reserve areas are necessary to allow resting period for the crop.

The Savannah Grasses, which are much coarser, with larger nodes, and which occur on many of the waste areas in India, have also been found very suitable. In connection with these reference may be made to *Agricultural Bulletin* Vol. II, No. 6, p. 148 in which appears a review by the writer on Mr. Raitt's investigation of the Savannah Grasses of India.

It was unfortunate to find among these grasses, that our greatest weed pest in this country—lallang—was found unsuitable.

The suitable grasses are calculated to add several million tons of raw material annually to the paper making resources of India. The principal requirements are cheap transport, fuel, and labour. Another promising material, to which considerable attention has been devoted in many countries, including Malaya, during the last two years is Hedychium coronarium, which is stated to yield 80 or 90 per cent of paper calculated on the air dry fibre. Messrs. Beadle and Stevens however appear to think that there is little chance of success outside Brazil where the plant grows profusely. Moga Grass (Pennisetum Alopecuros) is also said to be a very suitable material, and it is stated that 15,000 to 20,000 tons could be collected annually at a cost not exceeding £1 per ton.

Many other plants have also been investigated, but are not very promising. Another profitable source of raw material in India is probably seed cotton obtained mechanically from the down of the cotton seed; but the Indian cotton fibre has a shorter staple and the seed is usually very dirty, and hence not as remunerative as material from American seed.

Trinidad.

The principal material from which it may be possible to prepare pulp in Trinidad is bagasse or refuse cane, after the cane has been roller crushed to express the juice. The material contains about 80 per cent of cellulose, yielding about 45 per cent of air dried unbleached pulp.

This material is at present used chiefly as fuel, instead of coal, for engines driving the crushers.

A mixture of bamboo, bagasse and Para Grass has been found to produce a useful paper. Trinidad probably produces 50,000 tons of bagasse per annum which would yield 40,000 tons of pulp. Mr. Raitt calculates this material to be worth £2 per ton whereas its value as fuel is only 7/6 per ton.

Bamboo is also said to be receiving attention in Trinidad.

Australia.

Australia depends on its paper by importing from Great Britain, Canada and the U. S. A., although it has in recent years been thought possible to establish a pulp industry in the country, and one mill for the production of sulphate pulp from pine wood has been opened. Many grasses may be found suitable but hitherto none have been tried commercially; the most promising materials are Cyperus textilis, a good fibre plant and Lepidosperma gladiatum, abundant on the sea coasts. It is possible that the valuable forests of Tasmania may be found to yield suitable raw material and this is being investigated.

Prickly pear (Opuntia) and other plants have also received attention.

New Zealand.

Little information exists with regard to the possibilities of New Zealand in this direction but three species of wood have been found to be adaptable for the manufacture of wood pulp. It is probable however that most of the woods are too hard and more suitable for other purposes.

New Zealand flax (Phormium tenax), a plant grown for textile purposes, may prove very useful as a paper material but must be planted very close to be profitable.

British Africa.

In the lecturer's opinion, there are immense possibilities in the British possessions included under this heading.

In South Africa, maize, banana leaves, prickly pear, sisal hemp, wattle bark, tambookie grass, papyrus grass and bagasse may be suitable, but only the last three have been experimented with. Large areas in Zululand and Northern Transvaal are covered with papyrus and tambookie. These materials to be commercially profitable would require to be made up locally owing to the bulky nature of the half treated material and the consequent cost of freight. Tambookie grass has been found by the Imperial Institute to yield a larger percentage of bleached pulp than esparto. Other raw materials have been examined, but have not proved specially promising.

From other parts of British Africa mention may be made of the Baobab tree (Adansonia digitata) found in abundance in East and West Africa, and known also as the monkey bread tree. This tree grows in large clusters or small forests near the coast, and is used by the natives for making ropes and sacking, and has been found very suitable for strong light coloured wrapping papers.

Elephant Grass (Pennisetum purpureum) has also received attention and should prove valuable.

Considerable attention has been directed to the papyrus grass of the Sudan. It is stated to yield fairly good paper, but is stated by experts to be less valuable than esparto.

Federated Malay States.

Of special interest to those in Malaya however are the lecturer's references to the raw material for paper making in the Federated Malay States. The wastage of wood is particularly referred to, but as I have pointed out earlier in this paper, it is difficult for the layman to realise the technical difficulties involved in the treatment of wood for paper making. A forest, to the layman, represents so much raw material and little consideration is given to its suitability. It seems impossible from the mixed nature of our forests that they would be generally suitable for wood pulp. Secondly they could probably only supply a local demand or a demand for the Far East, as the material would have to be made into finished material here, owing to the cost of freights.

Pineapple fibre, to which reference is made, is, especially in connection with the Singapore canning industry, a waste material and might prove to be profitable, as the paper from combings is said to be quite good, and the yield 38 per cent of unbleached fibre from the combings.

Nipa palm has also been recently submitted to experiment and stated to produce promising samples of paper. The yield of fibrous material is however said to be low. By less drastic treatment a higher yield of coarser material was obtained, stated to be suitable for boxes, fibre and portmanteau boards. The combings can probably be treated mechanically in a beating engine without preliminary treatment for making tough wrapping papers and boards.

The lecturer concludes his reference to this country, by referring to the experimental paper plant purchased by the Department of Agriculture last year, which is now being erected, and by means of which it is hoped to investigate all the promising raw material in this country, including bamboo, lallang, Hedychium and other allied plants, wild banana, swamp grasses, nipa palm, various cultivated fibre plants, pine apple waste, coconut husk waste and possibly some of the softer woods.

At the present time and looking to the future it behoves us to investigate thoroughly on a scientific basis all the raw materials of the Empire for the various purposes to which they may be applied, so that, as far as possible, we may be able to rely on our own resources.

B. J. E.

CATALOGUE OF PLANT NAMES.

Contained in the Public Gardens, Kuala Lumpur, Federated Malay States.

By J. N. Milsum.

The following and subsequent list comprise the majority of the plants growing in the Public Gardens, Kuala Lumpur. In the absence of a complete herbarium, it is not possible at present to include numerous endemic species; for the same reason several Monocotyledonous orders are incomplete, notably Orchideae, also the Filices. This catalogue must therefore necessarily be preliminary.

It is intended, however, to supplement this list by further additions containing any new species acquired and others that may previously have not been identified.

Bentham and Hooker's arrangement has been followed for the Dicotyledons, but the genera of the Monocotyledons, to be published in the next issue of the *Agricultural Bulletin*, have been arranged alphabetically.

In most instances the natural habits and principal character of individual plants are given.

Dicotyledons.

RANUNCULACEÆ.

Clematis, L.

Clematis Flamula, *L.* Climber, Ornament, Europe.

DILLENIACEÆ.

Wormia, Rottb.

Wormia Burbidgei, *Hook, f.* Shrub, Ornament, Borneo.

Dillenia, L.

Dillenia indica, *L.* Tree, Edible fruit, Trop Asia.

MAGNOLIACEÆ.

Michelia, L.

Michelia Champaca, *L.* Tree, Ornament and scent, Malaya.
Champac.

ANONACEÆ.

Cananga, Rumph.

Cananga odorata, *Hook, f.* Tree, Perfume, India etc.

Anona, L.

Anona muricata, *L.* Tree, Edible fruit, T. America.
Soursop.

NYMPHÆACEÆ.

NYMPHÆA, L.

Nymphaea Lotus, *L.* Aquatic, Ornament, Asia and T. Africa.
Egyptian Lotus.

NELUMBIUM, Juss.

Nelumbium speciosum, *Willd.* Aquatic, Ornament & edible seeds, T. Asia.

CAPPARIDEÆ.

CLEOME, L.

Cleome speciosissima, *Deppe.* Annual, Ornament, Mexico.

PAPAVERACEÆ.

ARGEMONE, Tour.

Argemone mexicana, *L.* Annual, Ornament, Mexico.

BIXINEÆ.

BIXA, L.

Bixa Orellana, *L.* Shrub, Dye, T. America.
Arnatto.

PITTOSPOREÆ.

PITTOSPORUM, Banks.

Pittosporum ferrugineum, *Ait.* Tree, Malaya and Australia.
Ait, Giramong.

CARYOPHYLLACEÆ.

DIANTHUS, L.

Dianthus chinensis, *L.* Annual, Ornament, C. Asia.
Pinks.

PORTULACEÆ.

PORTULACA, L.

Portulaca oleracea, *L.* Herb, T. Region.

GUTTIFERÆ.

GARCINIA, L.

Garcinia Mangostana, *L.* Tree Ed: Fruit, Moluccas.
Mangosteen.

MESUA, L.

Mesua ferrea, *L.* Tree, Ornament and timber, India.
Ceylon Iron Wood.

MALVACEÆ.

MALVAVISCUS, Dill.

Malvaviscus arboreus, *Car.* H. Shrub, Ornament, S. America.

HIBISCUS, L.

Hibiscus mutabilis, *L.* H. Shrub, Ornament, China.

Hibiscus rosa-sinensis, *L.* H. Shrub, Ornament, Tropics.

ERIODENDRON, D. C.

Eriodendron anfractuosum, *D. C.* Fibre Tree, T. Asia, Africa.
Silk Cotton Tree.

DURIO, L.

Durio Zibethinus, *D. C.* Tree, Edible fruit, Malaya.
Durian.

STERCULIACEÆ.

COLA, Schotte and Endl.

Cola acuminata, *S. & E.* Tree, Edible fruit, T. Africa.
Cola Nut.

GUAZUMA, Plum.

Guazuma tomentosa, *H. B. K.* Tree, India and Java.

TILIACEÆ.

ELAEOCARPUS, L.

Elaeocarpus ganitrus, *Roxb.* Tree, Malaya.
Utrasan Beads.

MALPIGHIACEÆ.

MALPIGHIA, L.

Malpighia coccigera, *L.* Fl. Shrub, Ornament, W. Indies.

STIGMAPHYLLON, A. Juss.

Stigmaphyllum ciliatum, *A. Juss.* Fl. Climber, Ornament, Brazil.

TRISTELLATEIA, Thouars.

Tristellateia australasica, *R. Br.* Fl. Climber, Ornament, Malaya.

GERANIACEÆ.

PELARGONIUM, L'Hérit.

Pelargonium capitatum, *Ait.* Dwf. Herb, Perfume, S. Africa.
Scented-leaved Geranium.

IMPATIENS, L.

Impatiens Balsamina, *L.* Ornament, T. Asia.

Impatiens Sultani, *Hook. f.* Annual, Ornament, Zanzibar.

TROPAEOLUM, L.

Tropaeolum majus, *L.* Annual, Ornament, Peru.

RUTACEÆ.

CITRUS, L.

Citrus decumana, *L.* Tree, Edible Fruit, Tropics.
Pumelo.

Citrus medica, *L.*
Citron. Tree, Edible Fruit, T. Asia.

Citrus medica var Limonum.
Lemon. Tree, Edible Fruit, T. Asia.

Citrus medica var acida.
Lime. Tree, Edible Fruit, India.

AEGLE, Corr.
Aegle Marmelos, *Corr.* Tree, Drug, India.
Baël fruit.

SIMARUBEÆ.

QUASSIA, L.
Quassia amara, *L.* Shrub, Drug, Guiana.
Bitter Wood.

OCHNACEÆ.

OCHNA, L.
Ochna squarrosa, *L.* Fl. Shrub, Ornament, India.

BURSERACEÆ.

FILICIUM, Thw.
Filicium decipiens, *Thw.* Tree, Ornament, Ceylon.

MELIACEÆ.

MELIA, L.
Melia Azedarach, *L.* Tree, Medicine, India and China.
Bread Tree.

SANDORICUM, Cav.
Sandoricum indicum, *Cav.* Tree, Edible fruits, E. Indies.
Sentol.

SWIETENIA, L.
Swietenia Mahagoni, *Jacq.* Tree, Timber, S. America.
Mahogony.

AMPELIDEÆ.

VITIS, L.
Vitis discolor, *Dalz.* Climber, Ornament, Burma.

SAPINDACEÆ.

NEPHELIUM, L.
Nephelium lappaceum, *L.* Tree, Edible fruit, Malaya.
Rambutan.

PARANEPHELIUM, Miq.
Paranephelium macrophyllum, *King.* Tree, Edible fruit, Malaya.

ANACARDIACEÆ.

MANGIFERA, L.
Mangifera indica, *L.* Tree, Edible fruit, India.
Mango.
Mangifera foetida, *Lour.* Tree, Edible fruit, Malaya.
Bachang.

LEGUMINOSÆ.

CLITORIA, L.

Clitoria Ternatea, *L.* Climber, Ornament, E. Indies.

Clitoria Ternatea alba. Climber, Ornament.

Clitoria Ternatea flora plena. Climber, Ornament.

ERYTHRINA, L.

Erythrina indica, *Lam.* Tree, Ornament, T. Asia.

PTEROCARPUS, L.

Pterocarpus indicus, *Willd.* Tree, Timber, India and China.
Angsana.

CAMOENSIA, Welw.

Camoensia maxima, *Welw.* Fl. Climber, Ornament, T. Africa.

CAESALPINIA, L.

Caesalpinia pulcherrima, *Sw.* Fl. Shrub, Ornament, W. Indies.

Caesalpinia pulcherrima var Aurea, *Hort.* Fl. Shrub, Ornament, W. Indies.

POINCIANA, L.

Poinciana regia, *Boj.* F. Tree, Ornament, Madagascar.
Flame of the Forest.

CASSIA, L.

Cassia alata, *L.* Fl. Shrub, Medicinal, Tropics.

Cassia marginata, *Roxb.*

Cassia Fistula, *L.* Tree, Ornament, India.
Purging Cassia.

BAUHINIA, L.

Bauhinia tomentosa, *L.* Tree, Ornament, Tropics.

Bauhinia purpurea, *L.* Tree, Ornament, India and China.

Bauhinia acuminata, *L.* Shrub, Ornament, India and China.

BROWNEA, Jacq.

Brownea Ariza, *Benth.* Fl. Tree, Ornament, Columbia.

SARACA, L.

Saraca indica, *L.* Tree, Ornament, India and Malaya.

CYNOMETRA, L.

Cynometra ramiflora, *L.* Tree, Edible fruits, T. Asia.

PARKIA, R. Br.

Parkia Roxburghii, *G. Don.* Tree, Ornament, T. Asia.

ADENANTERA, L.

Adenanthera parvonina, *L.* Tree, Timber, Malaya.
Saga.

Adenanthera bicolor, *Moon.* Tree, Timber, Ceylon and Malaya.

MIMOSA, L.

Mimosa pudica, *L.* Small shrub, Brazil.
Sensitive Plant.

ACACIA, L.

Acacia farnesiana, *Willd.* Shrub, Drug, Tropics.
Cassie.

PITHECOLOBIUM, Mart.

Pithecolobium Saman, *Benth.* Tree, Ornament, T. America.
Rain Tree.

SAXIFRAGEÆ.

HYDRANGÉA, L.

Hydrangea Hortensia, *Sieb.* Shrub, Ornament, Japan.

CRASSULACEÆ.

KALANCHOE, Adans.

Kalanchoe sp. Ornament, Africa.

COMBRETACEÆ.

QUISQUALIS, L.

Quisqualis indica, *L.* Fl. Shrub, Ornament, T. Asia.

MYRTACEÆ.

MELALEUCA, L.

Melaleuca Leucadendron, *L.* Tree, Oil, Malaya.
Cajeputi.

BERTHOLLETIA, H. & B.

Bertholletia excelsa, *H. and B.* Tree, Edible fruits, Brazil.
Brazil Nut.

EUGENIA, Mich.

Eugenia caryophyllata, *Thunb.* Tree, Spice, Moluccas.
Clove Tree.

COUROUPITA, Aubl.

Couroupita guianensis, *Aubl.* Tree, Timber, Guiana.
Cannon Ball Tree.

LYTHRARIEÆ.

LAGERSTROEMIA, L.

Lagestroemia Flos-Reginae, *Retz.* Fl. tree, Ornament, India and Malaya.
Pride of India.

TURNERACEÆ.

TURNERA, L.

Turnera ulmifolia, *L.* Shrub, Ornament, T. America.

PASSIFLOREÆ.

PASSIFLORA, L.

Passiflora foetida, *L.* Fl. Climber, Cover Crop, Brazil.

Passiflora laurifolia, *L.* Fl. Climber, Edible fruits, T. America.
Sweet cup.

Passiflora quadrangularis, *L.* Fl. Climber, Edible fruits, T. America.

Passiflora trifasciata, *Lem.* Fl. Climber, Ornament, Brazil.

Passiflora watsoniana, *Mast.* Fl. Climber, Ornament.

CARICA, L.

Carica Papaya, *L.* Herb Tree, Edible fruits, T. America.

CUCURBITACEÆ.

CUCURBITA, L.

Cucurbita Maxima, *Duch.* Climber, Edible fruits, Tropics.
Gourd.

BEGONIACEÆ.

BEGONIA, L.

Begonia maculata, *Raddi.* Ornament, Brazil.

Begonia Rex, *Putz.* Ornament, Himalaya.

Begonia Semperflorens, *L. & O.* Ornament, Brazil.

CACTEÆ.

MAMILLARIA, Haw.

Mamillaria sp. Succulent Plant, Mexico.

OPUNTIA, Mill.

Opuntia sp. Succulent Plant, Mexico.

FICOIDEÆ.

MESEMBRYANTHENUM, L.

Mesembryanthenum coccineum, *Haw.* Annual Ornament, S. Africa.

UMBELLIFERÆ.

PETROSELINUM.

Petroselinum sativum, *Hoffm.* Herb, Edible, Temperate region.
Parsley.

ARALIACEÆ.

PANAX, L.

Panax cochleatum, *D. C.* Fl. Shrub, Ornament, Malaya.

Panax crispatum, *Hort.* Fl. Shrub, Ornament, Brazil.

CAPRIFOLIACEÆ.

LONICERA, L.

Lonicera macrantha, *Spreng.* Fl. Shrub, Ornament, Himalaya.

RUBIACEÆ.

MUSSAENDRA, L.

Mussaendra erythrophylla, *Sch.* Shrub, Ornament, Congo.

Mussaendra frondosa, *L.* Shrub. Ornament, India & Malaya.

RANDIA, L.

Randia macrantha, *D. C.* Fl. Shrub, T. Africa.

GARDENIA, Ellis.

Gardenia florida, *L.* Fl. Shrub, Ornament, China and Japan.

IXORA, L.

Ixora coccinea, L. Fl. Shrub, Ornament, India.

Ixora coccinea var luteus. Fl. Shrub, Ornament.

Ixora pendula, *Jack.* Fl. Shrub, Ornament, Malaya.

Ixora macrothyrsa, *B. & T.* Fl. Shrub, Ornament, Sumatra.

COMPOSITÆ.

ASTER, L.

Asters in var. Annual, Ornament.

ZINNIA, L.

Zinnia elegans, *Jacq.* Annual, Ornament, Mexico.

HELIANTHUS,

Helianthus annuus, *L.* Annual, Ornament, N. America.
Annual Sunflower.

COREOPSIS, L.

Coreopsis sp. Annual, Ornament.

DAHLIA, Cav.

Dahlia var. Annual, Ornament, Mexico.

COSMOS, Cav.

Cosmos diversiflorus, *Otto.* Annual, Ornament, N. America.

CHRYSANTHEMUM, L.

Chrysanthemum sinensis, *Sab.* Annual, Ornament, China and Japan.

PLUMBAGINEÆ.

PLUMBAGO, L.

Plumbago capensis, *Thunb.* Fl. Shrub, Ornament, S. Africa.

Plumbago capensis var alba. Fl. Shrub, Ornament, S. Africa.

Plumbago rosea, *L.* Fl. Shrub, Ornament, India.

OLEACEÆ.

JASMINUM, L.

Jasminum officinale, *L.* Shrub, Ornament, China.

APOCYNACEÆ.

ALLAMANDA, L.

Allamanda nerifolia, *Hook.* Shrub, Ornament, T. America.

Allamanda Schottii, *Hook.* Shrub, Ornament, Brazil.

Allamanda Williamsii, *Hort.* Shrub, Ornament, Brazil.

Allamanda violacea, *Gaertn.* Shrub, Ornament, Brazil.

Allamanda cathartic, *L.* Shrub, Ornament, T. America.

KOPSEA, Blume.

Kopsea fruiticosa, *A. D. C.* Fl. Shrub, Ornament, India and Malaya.

VINCA, L.

Vinca rosea, *L.* Herbaceous, Ornament, Tropics.

Vinca rosea var alba. Herbaceous, Ornament, Tropics.

PLUMERIA, L.

Plumeria lutea, *R. and P.* Fl. tree, Ornament, Peru. *Frangipanni.*

Plumeria rubra, *L.* Fl. tree, Ornament, T. America.

TABERNAEMONTANA, L.

Tabernaemontana coronaria, *Willd.* Ornament, India.

NERIUM, L.

Nerium Oleander, *L.* Fl. Shrub, Ornament, Orient.

Nerium Oleander var alba. Fl. Shrub, Ornament, Orient.

BEAUMONTEA, Wall.

Beaumontea grandiflora, *Wall.* Fl. Shrub, Ornament, India. Nepal Trumpet Flower.

ODONTADENIA, Benth.

Odontadenia speciosa, *Benth.* Fl. Shrub, Ornament, S. America.

STROPHANTHUS, D. C.

Strophanthus hispidus, *D. C.* Fl. Shrub, Ornament, T. Africa.

ASCLEPIADEÆ.

STEPHANOTIS, Thou.

Stephanotis floribunda, *Brongn.* Fl. Climber, Ornament, Madagascar.

HOYA, R. Br.

Hoya coronaria, *Bl.* Fl. Climber, Ornament, Malaya.

LOGANIACEÆ.

BUDDLEIA, L.

Buddleia sp. Fl. Shrub, Ornament.

FAGRAEA, Thumb.

Fagraea fragrans, *Roxb.* Tree, Ornament, India and Malaya. *Tembusa.*

POLEMONICEÆ.

PHLOX, L.

Phlox Drummondii, *Hook. f.* Fl. annual, Texas.

CONVOLVULACEÆ.

CONVOLVULUS, L.

Convolvulus mauritanicus, *Boiss.* Climber, Ornament, N. Africa.

IPOMAEA, L.

Ipomaea carnea, *Jacq.* Fl. Shrub, Ornament, S. America.

Ipomaea digitata, *L.* Fl. Shrub, Ornament, Tropics.

Ipomaea Horsfalliae var Briggsii. Fl. Shrub, Ornament, N. India.

Ipomaea Leari, *Part.* Fl. Shrub, Ornament, Ceylon.

Ipomaea Quamoclit, *L.* Fl. Shrub, Ornament, Tropics.

JACQUEMONTIA, Choicy.

Jacquemontia violacea, *Choicy.* Fl. Climber, Ornament, Mexico.

SOLANACEÆ.

LYCOPERSICUM, Hill.

Lycopersicum esculentum, *Hill.* Herbaceous, Edible fruit, S. America.

Tomato.

SOLANUM, L.

Solanum maronicuse, *Poit.* Fl. tree, Ornament, Brazil.

Solanum Melongena, *L.* Herb, Edible, Tropics, O. W.

Solanum Seaforthianum, *Andr.* Fl. climber, Ornament, Brazil.

Solanum Wendlandii, *Hook. f.* Fl. climber, Ornament, Costa Rica.

CAPSICUM, L.

Capsicum annuum, *L.* S. Shrub, Edible, S. America.

Capsicum.

PETUNIA, Juss.

Petunia garden vars. Fl. Annual, Ornament; Argentina.

BRUNSFELSIA, Plum.

Brunsfelsia americana, *L.* Fl. Shrub, Ornament, T. America.

Brunsfelsia calycina, *Benth.* Fl. Shrub, Ornament, Brazil.

SCROPHULARINEÆ.

RUSSELIA, Jacq.

Russelia juncea, *Zucc.* Fl. Shrub, Ornament, Mexico.

Russelia sarmentosa, *Jacq.* Fl. Shrub, Ornament, T. America.

TORENIA, L.

Torenia asiatica, *L.* Annual, Ornament, T. Asia.

LENTIBULANEÆ.

UTRICULARIA, L.

Utricularia sp. Submerged Aquatic, Malaya.

GESNERACEÆ.

GLOXINIA, L'Hérit.

Gloxinia hybrids. Tubers, Ornament, S. America.

ACHIMENES, R. Br.

Archimines coccinea, *Pers.* Tubers, Ornament, W. Indies.

AESCHYNANTHUS, Jack.

Aeschnanthus lobbiana, *Hook.* Shrub, Ornament, Java.

CHIRITA, Ham.

Chirita rupestris, *Ridl.* Herb, Ornament, Malaya.

BIGNONIACEÆ.

BIGNONIA, L.

Bignonia magnifica, *Bull.* Fl. Shrub, Ornament, Colombia.

TECOMA, Juss.

Tecoma jasminoides, *Lindl.* Fl. Shrub, Ornament, Australia.

SPATHODEA, Beaud.

Spathodea campanulata, *Beauv.* Fl. Tree, Ornament, T. Africa.

JACARANDA, Juss.

Jacaranda ovalifolia, *R. Br.* Fl. Tree, Ornament, S. America.

KIGELIA, D. C.

Kigelia pinnata, *D. C.* Tree, Ornament, T. Africa.
Sausage Tree.

PEDALINEÆ.

SESAMUM, L.

Sesamum indicum, *L.* Herb, Oil, India.
Gingelly Oil Plant.

ACANTHACEÆ.

THUNBERGIA, Retz.

Thunbergia alata, *Boj.* Fl. climber, Ornament, T. Africa.

Thunbergia erecta, *Audr.* Fl. shrub, Ornament, T. Africa.

Thunbergia erecta var alba. Fl. shrub, Ornament, T. Africa.

Thunbergia fragrans, *Roxb.* Fl. shrub, Ornament, Malaya.

Thunbergia grandiflora, *Roxb.* Climber, Ornament, India.

Thunbergia grandiflora var alba. Climber, Ornament, India.

Thunbergia laurifolia, *Lindl.* Climber, Ornament, Malaya.

SANCHEZIA, R. and P.

Sanchezia nobilis, *Hook. f.* Shrub, Ornament, Ecuador.

STROBILANTHES, Bl.

Strobilanthes dyerianus, *Hook. f.* P. Herb, Ornament, Burma.

ACANTHUS, Tourn.

Acanthus montanus, *Anders.* Fl. perennial, Ornament, T. Africa.

CROSSANDRA, Salisb.

Crossandra undulaefolia, *Salisb.* Fl. shrub, Ornament, India and Malaya.

ERANTHEMUM, L.

Eranthemum Wattii. Fl. Shrub, Ornament, Polynesia.

JACOBINIA, Moric.

Jacobinia chrysostephana, *B. and H.* Fl. Shrub, Ornament, Mexico.

Jacobinia magnifica var carnea. Fl. Shrub, Ornament, Brazil.

GRAPTOPHYLLUM, Nees.

Graptophyllum hortense, *Nees.* Fl. Shrub, Ornament, T. Asia. *Caricature Plant.*

VERBENACEÆ.

LANTANA, L.

Lantana Camara, *L.* Fl. Shrub, Ornament, Trop. America.

PETREA, L.

Petrea volubilis, *L.* Fl. Shrub, Ornament, T. America.

DURANTA, L.

Duranta Plumieri, *Jacq.* Fl. Shrub, Ornament, S. America.

CLERODENDRON, L.

Clerodendron fallax, *Lindl.* Fl. Shrub, Ornament, Java.

Clerodendron fragrans, *Vent.* Fl. Shrub, Ornament, China and Malaya.

Clerodendron Thomsonae, *Balf.* Fl. Shrub, Ornament, T. Africa.

Clerodendron speciosum, *Garden hybrid.* Fl. Shrub, Ornament.

Clerodendron myrmecophilum, *Ridley.* Fl. Shrub, Ornament, Malaya.

HOMSKIOLDIA, Retz.

Holmskioldia sanguinea, *Retz.* Fl. Shrub, Ornament, India.

CONGEA, Roxb.

Congea tomentosa, *Roxb.* Fl. Shrub, Ornament, Burma.

LABIATÆ.

COLEUS, Lour.

Coleus Blumei in var. Herb Plant, Ornament, Java.

SALVIA, L.

Salvia spendens, *K-G.* Showy Annual, Ornament, Brazil.

Salvia coccinea, *Juss.* Showy Annual, Ornament, C. and S. America.

NYCTAGINEÆ.

BOUGAINVILLAEA, Comm.

Bougainvillaea glabra, *Chois.* Fl. shrub, Ornament, Brazil.

Bougainvillaea glabra var Sanderiana, *Hort.* Fl. shrub, Ornament, Brazil.

Bougainvillaea laterita, *Hort.* Fl. shrub, Ornament, Brazil.

AMARANTACEÆ.

CELOSIA, L.

Celosia cristata, *L.* Showy Annual, Ornament, Tropics. *Cocks-comb.*

AMARANTHUS, L.

Amaranthus gangeticus, *L.* Showy Annual, Ornament.

Amaranthus tricolor, *L.* Showy Annual, Ornament, E. Indies. Indies.

Amaranthus salicifolius, *Hort.* Showy Annual.

POLYGONACEÆ.

ANTIGONUM, Endl.

Antigonum leptopus, *Hook and Arn.* Fl. climber, Ornament, Mexico.

Antigonum leptopus var alba. Fl. climber.
Honolulu Creeper.

NEPENTHACEÆ.

NEPENTHES, L.

Nepenthes sp. Pitcher Plant, Ornament, Malaya.

ARISTOLOCHIACEÆ.

ARISTOLOCHIA, L.

Aristolochia hians, *Willd.* Fl. climber, Ornament, Venezuela.

LAURINEÆ.

CINNAMOMUM, L.

Cinnamomum Camphora, *Nees.*
Camphor. Tree, Camphor, China and Japan.

PROTEACEÆ.

GREVILLEA, R. Br.

Grevillea robusta, *Cunn.* Tree, Ornament, Australia.
Silky Oak.

LORANTHACEÆ.

LORANTHUS, L.

Loranthus ferrugineus, *Roxb.* Parasitic, Malaya.

EUPHORBIACEÆ.

EUPHORBIA, L.

Euphorbia pulcherrima, *Willd.* Fl. Shrub, Ornament, Mexico.

HEVEA, Aubl.

Hevea brasiliensis, *Muell.* Tree, Rubber, Brazil.
Para Rubber.

ALEURITES, Forst.

Aleurites fordi. Wood Oil Tree, China.

CODIAEUM, Rumph.

Codiaeum vars. Shrub, Ornament.
Numerous garden varieties known as Crotons.

MANIHOT, Adans.

Manihot Glaziovii, *Muell.* Tree, Ceara Rubber, Brazil.

Manihot utilissima, *Pohl.* Shrub, Edible Tubers, Brazil.
Tapioca.

RICINUS, L.

Ricinus communis, *L.* Annual, Drug, Tropics.
Castor Oil.

ACALYPHA, L.

Acalypha macrophylla, *H. B. K.* Shrub, Ornament, Polynesia.
Acalypha hispida, *Burm.* Shrub, Ornament, New Guinea.
Acalypha Hamiltoniana, *Hort.* Shrub, Ornament.
Acalypha marginata, *Spreng.*
Acalypha Godseffiana, *Mast.* Shrub, Ornament, New Guinea.

URTICACEÆ.

FICUS, L.

Ficus Benjamina, *L.* Tree, Ornament, T. Asia.
Wamingin.
Ficus elastica, *Roxb.* Tree, Ornament and Rubber, India.
Rambong.
Ficus religiosa, *L.* Tree, Drug, E. Indies.
Pepul.
Ficus pumila, *L.* Climber, Ornament, Indo-Malaya.

ARTOCARPUS, Forst.

Artocarpus incisa, *L.* Tree, Edible fruits, Malaya.
Bread Fruit.
Artocarpus integrifolia, *L.* Tree, Edible fruits and timber, Malaya.
Jack Fruit.

PELLIONIA, Gaud.

Pellionia javanica, *Wedd.* Creeper, Ornament, Malaya.

CASUARINEÆ.

CASUARINA, L.

Casuarina equisetifolia, *Forst.* Tree and timber, Ornament, Australia.

CONIFERÆ.

CUPRESSUS, L.

Cupressus funebris, *Endl.* Tree, Ornament, China.
Funeral Cypress.

DACRYDIUM, Soland.

Dacrydium elatum, *Wall.* Tree, Ornament and timber, Malaya.
Ru Bukit.

PINUS, L.

Pinus canariensis, *C. Sm.*

CYCADACEÆ.

CYCAS, L.

Cycas revoluta, *Thunb.* Shrub, Ornament, Japan.
Cycas circinalis, *L.* Shrub, Ornament, Malaya.

(*To be continued.*)

A DISEASE OF CINNAMON

By A. Sharples,

The true Cinnamon—*Cinnamomum zeylanicum*—is a fairly large tree under natural conditions but under cultivation exists as a coppiced bush. Individual bushes growing in the Experimental Gardens at Kuala Lumpur have been dying for some time. The first symptom noticed is the death of one of the branches. The rest of the bush appears healthy but ultimately other branches begin to die off. The leaves wilt but remain attached.

An affected branch shows the whole cortex to be diseased. This diseased cortex is dark-brown in colour. On splitting open the wood the outer layers show a dark-grey coloration about $\frac{1}{8}$ inch deep resembling that produced in the wood of rubber trees by *Diplodia cacaoicola*.

Sections through the diseased cortex showed the presence of a fungus—*Pestalozzia palmarum*, a common parasite on the coconut palm. The fruit-bodies of the fungus are embedded in the rotting tissues of the cortex and when the cortex is completely disintegrated the spores are liberated and provide fresh means of infection. In the discolored wood the hyphae of the fungus are easily observed when sections are stained with Cotton Blue though when untreated are difficult to see because of their hyaline nature.

Small portions of the discolored wood were cut out with a sterile knife and placed on Potato Agar in test tubes. Two days later the hyphae of the fungus appeared in the culture and four days after sowing the characteristic black fruit-bodies were evident amongst a luxurious growth of white mycelium. The fruit-bodies were examined and the typical spores observed under the microscope.

On the Coconut this fungus is dangerous only when the trees are growing under unfavourable conditions. Even then its attack is localised and can usually be controlled. The same remarks apply to this attack on Cinnamon observed in the Experimental Gardens, though if neglected the fungus causes the death of the whole bush.

Pestalozzia palmarum is reported from Ceylon as attacking the leaves of Cinnamon bushes, causing what is termed "Grey blight." This is not so serious as the stem attack for the latter renders the bush valueless for cinnamon production.

The most effective method of preventing the spread of the fungus is to cut off the diseased branches well below the affected parts and burn them immediately, thus preventing the liberation of the spores embedded in the rotting cortex.

METHODS AND MATERIALS FOR THE CONTROL OF INSECT PESTS.

By P. B. Richards.

PART VI.

Chemical Measures. II Contact Poisons. (*Continued.*)

The field of commercial enterprise offered by contact poisons has been exploited more than any other form of insecticides, with the result that there are now on the markets of the world large numbers of patent preparations, widely advertised but in the main calculated rather to bring profit to the pockets of the vendors than advantage to the users. Some proprietary spray-fluids are of considerable insecticidal value, while others are worse than useless. Those which are good are usually expensive, while the bad ones are dear at any price. None will bear comparison, as to efficiency and cheapness combined, with the standard non-proprietary washes or emulsions.

The only point upon which the patent insecticides can fairly claim advantage is that of convenience. Making spray fluids for oneself is certainly more laborious than purchasing them ready for use. There is often, too, some doubt as to one's ability to prepare the material properly, which may be the deciding factor in purchasing an inferior spray fluid at a high price. Given a little care and attention, there is no reason whatever why almost all that is necessary in the way of contact sprays should not be made by the user. If, however, it is decided to purchase a patent preparation, the immediate purpose for which it is required should be carefully considered and an insecticide obtained which is prepared for that purpose. The use of extensively advertised cure-alls should be rigidly avoided.

Whereas the use of home-made standard insecticides is recommended as against the purchase of expensive proprietary spray-fluids, there is yet a perfectly legitimate field for enterprise in the preparation and marketing of standard washes and emulsions. If prepared in quantity by local firms, standard insecticides could be retailed at a profit at such prices as would render it not worth while for the planter to go to the trouble of making them for himself. To mention a few, there should be a market for naphthaline emulsion and tobacco extract, the preparation of which have been described; for lime sulphur concentrate, rosin wash and kerosene emulsion; and for crude oil emulsion, the preparation of which requires apparatus which would not be available on many estates.

Lime-Sulphur.

Lime sulphur sprays consist of a solution of a chemical combination of calcium and sulphur as calcium pentasulphide, and of these elements together with oxygen as calcium thiosulphate. It was originally used as a sheep dip, but is now used as a combined insecticide and fungicide. It is probably the most extensively used of all insecticides in America, and though it has not yet such a vogue in Europe it is rapidly finding favour. It has not yet been used to any extent in India and the Middle-East, so far as the writer is aware, but it is highly probable that it will be of considerable value in coping with particular pests.

The literature dealing with the preparation and use of this insecticide is voluminous and there are correspondingly many formulae and processes advised for its preparation. Two only will be given, known as the California formula, and the Savastano formula, respectively.

California Formula.

This preparation, which is also known as the 1: ½: ½ formula for lime-sulphur contains sulphur (flowers or finely ground) 1 lb., fresh burnt lime ½ lb., and water ½ gallon. This formula may easily be adapted to any size of cooking vessel. Thus, if a boiler of 30 gallons capacity were used, sufficient materials for twenty gallons of lime-sulphur concentrate would be taken, allowing the remaining third of the boiler for frothing. The quantities would then be sulphur 40 lbs., lime 20 lbs., water 20 gallons.

The sulphur should be in the form of flowers of sulphur or finely ground, and should be free from lumps. If lumpy it should be passed through a fine sieve before using.

The lime should be fresh burned, not more than 3 days old at longest in this climate. It is essential to the success of the operation that magnesian limestone should not be used as magnesium oxide breaks down the sulphur compounds which are the active constituents of the spray. Lime containing a greater proportion than 5% of magnesium oxide is not suitable for the preparation of lime-sulphur wash. Many limes contain a considerable proportion of impurities which may not affect the reactions, but which should be estimated and allowed for in weighing out the quantities. The following is a summary of a ready method for estimating the impurities given by Andrews in the India Tea Association Scientific Department Quarterly Journal 1913. Part 3.

"The apparatus required consists of (1) a glass cylinder about "2½ inches in diameter and 15 inches high, which should be "graduated in cubic centimetres, and (2) a boiling vessel to hold "about three pints. A quart of water should be poured into the "vessel, and the level at which it stands should be marked on a "piece of stick held vertically; then pour out the water. Weigh "out carefully 2 oz. of the lime to be tested, place in the vessel "and slake with water, adding the water gradually, not covering "up the lime with it until the slaking is complete. Then stir the "slaked lime into a paste with more water, continuing to add water "until the level marked on the stick is reached, and then boil. "Weigh 4 oz. of flowers of sulphur and stir vigorously into the "boiling lime-water. Boil gently for one hour, filling up to the "mark with more water every ten minutes, stir quickly and pour "into the glass cylinder. Allow it to stand overnight, and then "measure the amount of the sediment in cubic centimetres."

The following table derived from the author's figures, gives, in the first column the number of cubic centimetres of sediment, in the second the approximate percentage of impurity, and in the third the weight of lime necessary to replace effectively 100 lbs. of pure lime.

c.c.s. of sediment measured.	% impurity.	Impure lime equivalent to 100 lbs. pure lime.
30	5	105
50	10	111
70	15	118
90	20	125
105	25	133
120	30	143

Two boilers should be available of which the main one in which the concentrate is to be prepared should be either of iron or tin—not of copper as this is attacked during the reaction. Have ready in one boiler a quantity of hot water. Place the lime in the main boiler and add one gallon of hot water for every two and a half pounds of lime. As soon as the lime begins to slake, add the sulphur in the proportion of two pounds to each pound of lime. The sulphur may for convenience be made into a paste with water before mixing with the lime. The violent heat generated by the slaking of the lime brings about a chemical combination between the lime and sulphur. In order to ensure the combination of all the sulphur, the mixture must be thoroughly stirred during the whole of the period of slaking. When all the lime is slaked, add more hot water to make up to the half gallon per lb. ratio, and boil

slowly until all the sulphur and lime are dissolved. This should take place in from 30 to 45 minutes, the resultant solution being a clear reddish brown liquid. Boiling should not be continued beyond one hour. As the liquid boils away, it must be kept up to quantity by adding hot water from the reserve boiler. This is arranged for beforehand by marking on the boiler or on a measuring stick the height to which the cold water used will rise when heated to boiling, making allowance for expansion which is about 1/20th of the volume. Thus twenty gallons of solution cold would be twenty one at boiling temperature; fifty gallons would be fifty two and a half, and so on.

The following quantities are convenient for practical purposes: 100 lbs. flowers of sulphur, 52½ lbs. quicklime, allowing for 5% impurities, and 50 gallons water.

The concentrate should not be allowed to stand exposed to air. If it is not intended for immediate use it should be strained and poured into barrels and kept as nearly airtight as possible.

Savastano (Italian) Formula.[1]

This consists of 3 parts sulphur, 1 part lime and 10 parts water all by weight.

The sulphur must be in the form of flowers or finely ground, capable of being readily sifted through a coarse latex strainer.

The lime must be freshly burned—if it has begun to crumble from air-slaking with absorbtion of moisture and carbon dioxide it is useless. The selection of the lime for use requires considerable care. Very small pieces and big lumps are equally unsuitable for use in this method of preparation. A correction for impurities should if possible be made by the method already indicated.

The inventor of this formula lays considerable stress upon the preparation of definite quantities, viz: 35 pints, 11 gallons or 22 gallons. It is not obvious why the formula should not be adaptable to any quantities, but the author's figures will be given here.

For the small quantity—35 pints—the weights required are 4½ lbs. effective lime, and 12½ lbs. sulphur. For preparation on the large scale—22 gallons—the requisites are 66 lbs. sulphur, and 22 lbs. lime.

Two boilers should be available, of which the one in which the mixture is to be prepared must not be of copper. Iron boilers are best. There should also be available a kerosene tin or large pail for measuring the water, the levels for 8¾ pints and 17½ pints being marked inside.

(1) Review of Applied Entomology II A, Part 7, July 1914 pp. 412-413.

Measure out the quantity of cold water into the main boiler, equal to the final quantity of spray concentrate desired, with an additional 2½% to allow for the expansion on heating to boiling: that is, if twenty two gallons is to be made, measure out 22 gallons plus one gallon and one pint. Mark the height reached by making a notch in a measuring stick held vertically in the centre of the boiler. In the subsequent boiling this level is of great importance. Having obtained the measurement, empty the boiler. Heat in the accessory boiler a quantity of water about one quarter in excess of the quantity of concentrate required.

A strong stick or paddle is required for stirring the mixture, and a wire sieve should be provided for rapidly and evenly shaking in the sulphur.

The main boiler is placed over a moderate fire, and a quantity of cold water poured in; 8¾ pints for the 35 pint quantity, or 35 pints for the 22 gallon mixture. As soon as the water is just tepid the lime should be thrown in. No stirring must be done yet. When the lime begins to boil the sulphur is added by being passed through the sieve held over the boiler.

Great care must be exercised at this point in the preparation. While the sulphur is being sifted in, the mixture should be stirred. If all the water is absorbed, a little hot water should be measured off and added, as otherwise the sulphur may ignite. Stirring must be continued until a yellow-white mixture results, the success of the operation depending on this. The mixing is sufficient when very little sulphur remains floating on the surface. Should the mixture thicken too much when mixing, a further measured quantity of hot water should be added.

The next stage in the preparation consists of the addition of sufficient hot water to make up, with that already used, the final quantity of concentrate, that is up to 35 pints, or 22 gallons as the case may be. To this is added an equivalent quantity of water to that first used, namely 8¾ or 35 pints, to replace the water used up in slaking the lime, and to bring the bulk up to or above the level on the measuring stick. The mixture is now boiled over a steady fire for about an hour and must be kept stirred. During the boiling the mixture must not be allowed to drop in level below the measuring mark. Any loss from evaporation below this level must be made good by the gradual addition of hot water.

The mixture should at first be orange colour, but will darken, finally becoming chocolate or roasted-coffee colour. To ascertain if the liquid is ready, a little of it is taken up in a wooden spoon and watched, when fine light coloured grains should be seen in a

reddish liquid, and the froth and floating sulphur should have almost or quite disappeared. It is necessary to wait until the mixture has evaporated down to the exact measure, and the hour limit may be slightly exceeded in doing so. When cold the mixture may be stored in kerosene tins stopped with a rag bung or soldered, or a glass or earthenware carboy may be used if capable of being tightly closed.

This preparation of lime sulphur is said to keep well for several months, if sealed. For use on bark and on foliage it should be diluted in relation to its sulphur-lime content. For application to old bark, a strength of 4% to 8% is obtained by diluting with from nine to four volumes of water. For use on foliage the strength should be about 0.6%, entailing dilution by sixty five gallons of water to one of the stock solution.

Properties.

Commercial concentrated lime-sulphur is a clear reddish brown liquid consisting of a solution of calcium thiosulphate and polysulphides of calcium. For use, the material, which is now largely obtainable in Europe and America, only needs to be diluted with water. The proper dilution is generally indicated on the drum, but it is the usual practice to test the specific gravity with a hydrometer graduated according to prepared tables. Of these a modification is attached, adapted for local use with California formula in the absence of a Baumé hydrometer. This method is however, open to grave objections. The specific gravity test indicates only the total lime, sulphur, and impurities contained in the solution. It does not indicate in the least the proportion of active insecticidal constituents in the spray. There is, however, at present no other ready means of determining the requisite dilution, so the system stands.

The effective ingredients in lime-sulphur wash are the polysulphides of calcium. The contained calcium thiosulphate slowly decomposes, after spraying, with the liberation of free sulphur, but this action is probably too slow to have much effect. There is usually present a certain amount of relatively insoluble sulphite which has no insecticidal value. The polysulphides, on the other hand, are very active insecticides, particularly against scale insects. Their insecticidal properties depend upon three causes:—

(1). Their power of absorbing oxygen.
(2). Their ability to soften the margins of scale insects.
(3). The amount of nascent sulphur formed in their decomposition.

The combination of the moist polysulphides with oxygen is extremely rapid, thus probably depriving the treated insects of their supply and causing asphyxiation. No chemical explanation has been given of the softening effect of the polysulphides upon the scales of coccids, but Shafer has shown that the so-called wax about the margin of the scale is so much softened that on drying the insect becomes so tightly stuck to the plant as to cause the death of the parent insect and also of the young which are sealed under the scale cover of the mother.

Concentrated lime-sulphur is very unstable when exposed to air. Reddish brown crystals of pentasulphide and tetrasulphide of calcium are precipitated, and the calcium thiosulphate is decomposed leaving a solution which is not only without benefit, but may be actively harmful to plants. Good lime-sulphur is reputed to have a stimulating effect upon plant growth.

Uses.

Lime sulphur wash can only be used at "Summer" strength in Malaya. It has been suggested that the "Winter" wash, which is the strength used on dormant deciduous trees in countries having a definite winter, might be useful for preventing the attack of deer, pig, porcupines, &c. upon rubber trees. It is however, in a state of very considerable dilution that it seems likeliest to be of much use to agriculturists in the East.

Lime-sulphur has a slight stomach poison action upon young caterpillars. It has also some fungicidal effect. But its value locally will lie in its effect, even in very weak solutions, upon mites and the young larvae of scale insects. For this purpose one gallon of the stock solution should be diluted with one and a half times or twice the quantity of water indicated in the following table, and the wetting power increased by the addition of a solution of one ounce of gelatine to thirty three gallons of spray fluid.

Reading on Hydrometer in degrees Baume	No. of gallons containing 100 lbs sulphur and 50 lbs lime.	Lime-sulphur in lbs. per gallon of concentrate.	Gallons of water to 1 gallon concentrate winter Strength.	Gallons of water to 1 gallon concentrate Summer strength.
35	42	3.57	9	59
34	43½	3.45	8⅔	57
33	45	3.33	8⅓	55
32	47	3.19	8	53
31	49	3.07	7½	50
30	51	2.94	7¼	48
29	54	2.78	6¾	46
28	57	2.63	6⅓	43
27	60	2.50	6	41
26	63	2.38	5⅔	39
25	66	2.27	5⅓	37
24	70	2.14	5	35
23	74	2.03	4⅔	33
22	79	1.90	4⅓	31
21	85	1.76	4	29
20	91	1.65	3⅔	27
19	98	1.53	3⅓	25
18	105	1.43	3	23
17	112	1.34	2¾	21
16	120	1.25	2½	20
15	129	1.16	2¼	18½
14	140	1.07	2	17

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, During the Years 1915 and 1914.

Destination.	Exported during May, 1915.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1915.	Duty collected, 1915, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	$	$ c.
Straits Settlements ...	1,847.82	8,558.41	10,406.23	6,117 26	4,288.97	...	19,519,318	
United Kingdom ...	814.42	4,201.82	5,016.24	4,473.27	542.97	...	9,772,919	
Continent of Europe...	...	5.00	5 00	540.75	...	535.75	9,945	
Ceylon	45.64	219.17	264.81	312.25	...	47.44	512,900	
Other Countries ...	...	95.07	95.07	100.27	...	5.20	181,447	
Total ...	2,707.88	13,079.47	15,787.35	11,543.80	4,831.94	588.39	29,996,529	799,021 33

KUALA LUMPUR,
5th June, 1915.

F. J. WELD,
Acting Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of Malaya for the month of May, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bahru ...	...	138.	84.2	93 09	75.35	17.74	79.2	.894	75.9	76%	...	1.85	.98
Pahang, Kuala Lipis ...	...	...	83.5	92 6	76.3	16.3	77.0	...	...	...	...	6.60	1.58
Johore, Johore Baharu ...	...	...	...	90.62	75.30	15.32	...	...	...	...	...	7.09	...
Singapore, Kandang Kerbau	29.780	164.5	85.2	91.0	74.8	16.2	79.8	.941	...	78.0	...	2.84	0.56
Malacca, Durian Daun ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Negri Sembilan, Seremban	...	157.1	82.7	90.9	73.6	17.2	78.8	.909	76.3	81.8	N.W.	3.18	1.21
,, Kuala Pilah ...	...	160.4	81.9	92.4	72.5	19 8	80.1	.979	78.5	89.9	...	5.97	3.50
,, Port Dickson	...	137.4	85.1	90.6	76.	14.5	79.3	.886	75.5	73.5	...	3.28	2.12
Selangor, Kuala Lumpur ...	29.787	145.6	83.2	90.3	77.9	12.4	80.2	.964	77.9	84.	N.E.	5.46	1.50
,, Klang ...	...	...	83.9	87.8	76.8	11.0	78 9	...	...	...	...	4.33	0.88
,, Kuala Selangor ...	...	..	...	90.6	76.5	14.1	...	...	...	...	...	5.30	1.62
,, Rawang ...	...	...	...	95.0	73.1	21.9	...	...	...	...	...	1.81	0.41
Perak, Telok Anson ...	...	...	83.73	94.	72.	22.	78 33	.904	...	79.	...	3 55	0.80
,, Ipoh ...	...	...	84.23	95.	72.	23.	78.03	.878	...	75.	...	7.92	3.43
,, Taiping ...	...	...	84.31	94.	71.	23.	79.00	.924	...	79	...	14 42	3.40
,, The Cottage ...	...	...	...	...	...	...	...	...	...	...	...	20.57	3.19
,, Parit Buntar ...	...	...	84.54	94.	70.	24.	79.39	.940	...	83.	...	6.14	1.54
Penang, Georgetown ...	29.797	141.1	84.1	90.5	74.8	15.7	78.8	.914	75.5	78.	...	12.94	3.68
Kedah, Alor Star ...	...	...	...	...	...	...	...	...	...	...	...	9.41	...
Perlis, Perlis ...	...	...	...	...	...	...	...	...	...	...	...	..	...